AMENDMENTS TO THE SPECIFICATION:

Please amend the following paragraph commencing at page 6, line 5.

The present invention is a method and system for controlling the vulcanization (herein also denoted "curing") of rubber polymeric compounds. In particular, the present invention includes novel features for monitoring the polymerization and determining in real-time the optimum cure time for the production of parts made from rubber polymeric compounds (herein also denoted as "polymeric rubber compounds" or merely "rubber compounds"). According to the present invention, during the curing of rubber polymeric compounds, data streams of impedance values are obtained (denoted herein as "impedance data streams"), wherein these values are indicative of impedance measurements obtained from one or more capacitor circuits (CC). Each of the capacitor circuits is operatively configured so that such a rubber polymeric compound becomes part of the capacitor circuit, and in particular, becomes a dielectric for the circuit. For each of the impedance data streams there is a corresponding graphical representation for presenting the particular impedance properties versus time that are provided by the impedance data stream. Such graphs are denoted "process curves" herein, and each such process curve is generally identical in informational content to the impedance data stream from which the process curve is derived. Accordingly, [[in]] many embodiments of the present invention utilize[[s]] derived characteristics of the impedance data streams that is more easily described in terms of their graphical representations as process curves, e.g., shape and/or geometric curve characteristics such as slopes and/or an area under such a process curve. Note that such impedance data streams can be representative of a time series of one or more of the following impedance types of impedance values: the impedance (Z), phase angle (ø), resistance (R), reactance (X), conductance (G), and/or capacitance (C). Thus, the impedance data streams (and their related process graphs) are derived from the signal responses output by the activation of one or more of the capacitor circuits CC, wherein such activation is the result of at least one, and more generally, a plurality of signals of different frequencies being input to such capacitor circuit(s). Thus, in some embodiments of the present invention, each of the process curves may be obtained from a single, and in general different, signal frequency input to the capacitor circuit(s), and the corresponding

shape (or other computational characteristics) of each of [[a]] <u>the</u> process curves may be used in monitoring, controlling and/or predicting an outcome of a curing process for polymeric rubber compounds.

Please amend the following paragraph commencing at page 7, line 5.

In some embodiments of the present invention, various time series capacitor circuit output data components (i.e., impedance (Z), phase angle (ø), resistance (R), reactance (X), conductance (G), or capacitance (C)) are separately processed, thereby resulting in a process curve with distinctive shape (or other features) for each of these components. Accordingly, it is an aspect of the present invention that such features from impedance (Z), phase angle (ø), resistance (R), reactance (X), conductance (G), or capacitance (C) graphs (e.g., plotted versus time) can be used for monitoring and controlling the cure time by measuring a portion of the process curve and calculating or predicting the optimum cure time. Thus, since a particular shape (or other "computational features" such maxima, minima, slope, rate of slope, portion having substantially zero slope, inflection point, the area under a portion of the curve, etc.) of such process curves may be substantially repeatable for curing a particular rubber polymeric compound or material, such features can be effectively utilized in a mass production environment for producing consistentl<u>y</u> high quality cured products (e.g., seals, gaskets, and tires).

Please amend the following paragraph commencing at page 10, line 23.

It is a further aspect of the present invention that in various embodiments and for certain rubber compounds, one or more (preferably a plurality) of "evaluators" are provided for outputting values related to the cure time of a part. Such evaluators may be<u> for determining</u>, e.g., the corresponding slope or integrated area under one or more of the above described process curves. The output from each of the evaluators can be correlated with known curing times of rubber compound samples to thereby determine a predictive effectiveness of the evaluator. In one embodiment, the known curing times can be T90 times, T75 times, or T50 times that are determined by obtaining rheometric measurements of the samples during their curing. The

evaluators that exhibit a high degree of correlation to physically measured rheometric curing properties of the samples are used to infer useful information in monitoring, controlling and/or predicting the proper cure time of rubber compound molded parts such as parts that are mass produced. In at least one embodiment of the present invention, the output from two or more (e.g., four) evaluators providing the highest degree of correlation with the measured rheometric curing properties are combined (e.g., as a linear combination) to yield an even better predictor for predicting part curing times.

Please amend the following paragraph commencing at page 22, line 3.

The following steps of Fig. 12 may be performed when a rheometer is available for use[[d]] in conjunction with the mold 18:

Please amend the following paragraph commencing at page 23, line 8.

Each row of TABLE A following is illustrative of a typical or expected curing condition that may likely occur, wherein the term "~~normal~~<u>nominal</u>" in the mold temperature column of TABLE A [[is]] <u>refers to</u> a predetermined temperature that is believed to be at least an acceptable curing temperature, and likely a preferred curing temperature. Accordingly, for each table row, by curing one or more rubber compound 16 samples according to the curing condition specified [[by]] in the row, cure data can be obtained (which may be considered as calibration data in that this data becomes reference data to which various correlations are performed), wherein (as described hereinbelow) a first portion of this cure data includes impedance signal data (e.g., Z, Φ, R, X, G or C values) obtained from the capacitor(s) 68, and a second portion that includes curing related data obtained from samples cured in a rheometer, wherein such curing related data (also referred to as rheometric data) includes one or more curing times for curing a sample to corresponding cure states indicative of, e.g., a particular elasticity, and/or a particular compression set property.

Please amend the following paragraph commencing at page 26, line 21.

Multiple rubber compound samples are preferably cured for each in-mold curing condition, and more particularly, at least three such samples are cured per curing condition. For example, a production mold 18 can be set at a temperature 5 degrees below nominal, and batch A of a rubber compound 16 can be provided to this mold for obtaining impedance signal data during the curing of each of three rubber compound samples to the desired cure state (e.g., desired elasticity). Thus, once all the samples for batch A of the rubber compound 16 have been appropriately cured, the rubber compound 16 may then be changed to, e.g., batch B, and the impedance signal data for a plurality of batch B samples can be recorded. Accordingly, this process can be repeated until all designated rubber compound 16 batches have had samples therefrom cured, and accordingly an aggregate collection of impedance signal data is captured that is representative of the curing process for these batches. Note that although variations between rubber compound 16 batches are not, in general, believed to affect part curing as much as mold temperature, such variations can still impact the curing time and/or rate. However, by capturing impedance signal data as described here, most typical variations between rubber compound batches can be reflected in the aggregate collection. Thus, cure prediction data that is derived (in steps 29 and 30 hereinbelow) using this aggregate collection of impedance signal data that is believed to be predictive of the in-mold curing time and/or rate substantially independently of what rubber compound batch is ~~supplying~~ supplied to the mold 18 with the rubber compound to be cured. That is, it is assumed that for a given type of rubber compound the variations between batches of the given type of rubber compound will not vary substantially from the batches used to determine the rheometric data, e.g., of TABLE B above. In particular, for each of the production parts cured in the mold 18 from a single type of a rubber compound, the actual instance or portion of a batch of this rubber compound is assumed to have each of its constituent ingredients in a range provided by some of the instances of the rubber compound obtained from the batches used to determine the rheometric data, e.g., of TABLE B above.

Please amend the following paragraph commencing at page 31, line 28.

After obtaining impedance related measurements from the evaluators, a data table (or more generally, an association) is created (as illustratively shown by TABLE D following), wherein each row of the table identifies: (1) a particular curing condition, (2) the corresponding T90 time, and (3) a plurality of the impedance related measurements for various windows and from various evaluators. Note that only a portion of an actual data table is shown in TABLE D. An actual data table may include, e.g., up to or more than 640 impedance related measurements per row, wherein the 640 impedance related measurements can be obtained as follows: (8 signal frequencies input to the sensor circuit 62) times (2 data types (R and X, or G and C, or Z and Φ)) times (5 windows) times (8 impedance related measurements from the evaluators) = 640 measurements. Said another way, TABLE D below may include 640 impedance related measurement collections (i.e., columns) that can be used for determining cure predictors (e.g., cure prediction equations) that, in turn, can be subsequently used to generate cure predictions or estimates of each part of a collection of mass produced parts cured in mold 18. For simplicity of discussion, the term "impedance data column" shall denote the impedance related measurements obtained from a fixed one of the evaluators receiving input from a fixed one of the windows whose impedance measurements, in turn, were obtained for a single frequency of signals input to the sensor circuit 62.

Please amend the following paragraph commencing at page 33, line 17.

A simple illustrative example will now be provided to further show how the correlation between the impedance data columns and the T90 times is determined. Assume for each of a plurality of samples of a given rubber compound batch that both of the following data (a) and (b) below are obtained for the curing condition parameter(s) of interest (e.g., curing temperature):